

(12) **United States Plant Patent**
Zimmermann

(10) **Patent No.:** **US PP15,663 P2**
(45) **Date of Patent:** **Mar. 15, 2005**

(54) **HOP PLANT NAMED ‘YCR ACCESSION NO. 4’**

(50) Latin Name: *Humulus lupulus*
Varietal Denomination: **YCR Accession No. 4**

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(73) Assignee: **Select Botanicals Group, L.L.C.**, Toppenish, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 26 days.

(21) Appl. No.: **10/326,830**

(22) Filed: **Dec. 20, 2002**

Related U.S. Application Data

(60) Provisional application No. 60/343,939, filed on Dec. 27, 2001.

(51) **Int. Cl.⁷** **A01H 5/00**

(52) **U.S. Cl.** **Plt./236**

(58) **Field of Search** **Plt./236**

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(57) **ABSTRACT**

A new hop plant (*Humulus lupulus*) is disclosed. The new variety is used for its aromatic properties. The new variety is moderately tolerant to powdery mildew, and produces a medium size moderately compact cone with good pickability and storageability. The cones mature relatively late, and produce an exceptional yield of approximately 2200 to 3000 pounds per acre (2466 to 3363 kg/ha).

5 Drawing Sheets

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Latin name of the genus and species of the plant claimed:
Humulus lupulus.
Variety denomination: ‘YCR Accession No. 4’.

**STATEMENT REGARDING FERERALLY
SPONSORED RESEARCH OR DEVELOPMENT**

None.

BACKGROUND OF INVENTION

This invention relates to a new and distinct variety of hop plant (*Humulus lupulus*), and more particularly to a new hop plant resulting from the open pollination of ‘Swiss Tettanager’ (unpatented) as part of a controlled breeding program in 1998. Selection of the new variety and initial reproduction by root cuttings was carried out in a research nursery in Prosser, Wash., U.S.A. Subsequent asexual reproduction took place in Granger, Wash., U.S.A. The new variety has been stably reproduced over successive generations.

Both ‘YCR-4’ and its parent ‘Swiss Tettanager’ are classified as aroma hops, selected for desirable aroma quality. However, ‘YCR-4’ is distinguished from its parent ‘Swiss Tettanager’ by several characteristics, as set forth in Table 1.

TABLE 1

Comparison of ‘Swiss Tettanager’ and ‘YCR-4’		
Characteristics	‘Swiss Tettanager’	‘YCR-4’
<u>Brewing quality</u>		
Average alpha acid level (percent of cone weight)	4–6%	6–9%
Average beta acid level (percent of cone weight)	3–6%	6–8%
Ratio of alpha acid to beta acid	1:1	1:1
Average cohumulone level (percent of alpha acid)	20–25%	26–29%
Total oils (ml/100 g)	0.42–1.13	Approx. 1.5

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TABLE 1-continued

Comparison of ‘Swiss Tettanager’ and ‘YCR-4’		
5 Characteristics	‘Swiss Tettanager’	‘YCR-4’
<u>Storage quality</u>		
Stability (percent loss of alpha acids after 6 months storage at room temperature)	50%	20–30%
<u>Agronomics</u>		
Yield (lbs./acre)	1000–1300	2200–3000
Susceptibility to powdery mildew	More susceptible	Less susceptible
Resistance to downy mildew	Moderate	Moderate
15 Maturity date (Yakima Valley, Washington)	Early, 3 rd to 4 th week of August	Late, 2 nd week of September

BRIEF DESCRIPTION OF THE PHOTOGRAPHS

- FIG. 1 shows a hop plant of the new variety;
FIG. 2 shows a cone from a hop plant of the new variety;
FIG. 3 shows a cluster of cones on a hop plant of the new variety;
FIG. 4 shows the leaves of the hop plant of the new variety; and
FIG. 5 shows the vine of the hop plant of the new variety.

DETAILED DESCRIPTION OF THE VARIETY

The following is a detailed botanical description of the new hop plant, based on observations of specimens grown in Granger, Toppenish, Moxee, and Harrah, Wash. during the 2001 growing season. All colors are described according to The Royal Horticultural Society Colour Chart (Royal Horticultural Society, London). It should be understood that the botanical and analytical chemical characteristics described

will vary somewhat depending upon cultural practices and climatic conditions and can vary with location and season.

Bine:
Main bine color.—146D yellow green.
Stripe color.—183C greyed purple.
Stipule direction.—Outward-down, forked.
Stipule color.—144B yellow green.
Bine diameter.—At base: 0.7 cm; 9 feet from base: 0.8 cm; 18 feet from base: 0.7 cm.

Leaves:
Arrangement.—Opposite.
Shape.—Palmate.
Length.—Avg. 14.5 cm (mature leaf).
Width.—Avg. 13.0 cm (mature leaf).
Color.—Upper surface, mature leaf: 137A green. Lower surface, mature leaf: 137C green. Upper surface, immature leaf: 137B green. Lower surface, immature leaf: 137C green.
Number of lobes.—3–10.
Margin.—Serrated.
Serrations per inch.—6–7.
Pose.—Downward.
Petiole length.—Avg. 6.4 cm (mature).
Petiole color at base.—Varied, 183C greyed purple and 143A green.
Venation.—Reticulate.
Vein color.—145A yellow green.
Leaf resin gland color.—13C, 14C and 15D yellow.

Cones:
Length.—Avg. 3.02 cm.
Diameter.—Avg. 1.63 cm.
Bract tip color.—146B yellow green.
Bract base color.—145B yellow green.
Bracteole color.—145B yellow green.
Cone shape.—Ovoid.
Bract shape.—Ovate.
Bract tip shape.—Cuspidate.
Bract tip position.—Recurved.
Bracteole shape.—Narrowly rounded.
Lupulin gland color.—17A, 17B, 15A and 15B yellow.

Quality data:
Alpha acids (% of cone weight).—5.46–9.29 mean=7.44, n=10.
Beta acids (% of cone weight).—5.78–7.79 mean=7.14, n=10.
Cohumulone (% of alpha acids).—24.88–29.09 mean=26.95, n=8.
Total oils.—1.5 ml/100 g cones.
Storageability.—70.25%–78.03% alpha remaining about 6 months storage at room temperature.
Oil analytical data.—Table 2.

TABLE 2

Essential Oil Profile of YCR4			
106 mg of 10% Adsorbate/150 C/5 Min./1.0 ug Int. Std. By DTD-GC-MS			
(Peak Area Integration from DTD-GC-FID Analysis)			
MS		GC-FID	
Spec #	Peak Assignment	Peak Area	Area %
92	isoprene	3154.714	1.493
198	2-methyl-3-buten-1-ol	1457.541	0.690
296	d-8 toluene (internal standard)		
328	3-methyl-2-butenal	941.346	0.446
334	n-octane	798.296	0.378
339	acetic acid	1883.299	0.891

TABLE 2-continued

Essential Oil Profile of YCR4			
106 mg of 10% Adsorbate/150 C/5 Min./1.0 ug Int. Std. By DTD-GC-MS			
(Peak Area Integration from DTD-GC-FID Analysis)			
MS		GC-FID	
Spec #	Peak Assignment	Peak Area	Area %
370	isobutyric acid (2-methylpropanoic acid)	244.107	0.116
398	possibly pentyl alcohol	104.691	0.050
405	3-methylbutyric acid	301.569	0.143
412	2-methylbutyric acid	269.756	0.128
414	2-methyl-2-butanol acetate + 2,6-dimethyl-2,4-heptadiene	299.401	0.142
422	butyl-2-methylpropanoate (butyl isobutyrate)	266.414	0.126
433	alpha-pinene	126.371	0.060
448	possibly formamide	1261.861	0.597
464	beta-pinene + 2-methylbutyl propanoate	821.842	0.389
468	methyl, 5-methylhexanoate	97.371	0.046
476	myrcene	20782.279	9.837
484	hexanoic acid	368.963	0.175
490	3-methylbutylisobutyrate	1176.898	0.557
493	2-methylbutylisobutyrate	1034.212	0.490
501	alpha-phellandrena	346.454	0.164
508	alpha-terpinene	507.470	0.240
515	cis-ocimene	354.921	0.168
523	methylheptanoate	413.171	0.196
533	heptyl acetate	283.440	0.134
542	methyl, 6-methylheptanoate	748.568	0.354
547	heptanoic acid	834.398	0.395
554	linalool + pentyl-3-methylbutyrate	2160.128	1.022
570	methyl octanoate	683.501	0.324
582	methyl, 4-methyl-2-oxopentanoate	451.766	0.214
591	2,3-dihydro-3,5-dihydroxy-6-methyl-4(H)-pyran-4-one	684.438	0.324
604	2-nonanol	339.230	0.161
617	d-8 naphthalene (internal standard)		
623	methyl nonanoate (branched isomer)	2986.862	1.414
627	methyl-4-octenoic acid	870.192	0.412
635	2-decanol	944.855	0.447
643	methyl-6-nonenoate	931.681	0.441
655	methyl nonanoate	1465.176	0.693
661	nerol	444.129	0.210
675	2-methylheptyl propionate	881.313	0.417
681	unknown	230.901	0.109
686	geraniol + 2-undecanone (branched isomer)	1253.790	0.593
696	2-undecanol (branched isomer)	338.728	0.160
705	undecadienol isomer	326.548	0.155
712	undecenol isomer	721.289	0.341
717	methyl decanoate (branched isomer)	1098.103	0.520
722	2-undecanone	848.863	0.402
733	2-undecanol	1262.099	0.597
740	methyl-4-decenoate	12898.897	6.105
742	methyl-4,8-decadienoate	579.773	0.274
755	methyl geranate + methyl decanoate	2548.231	1.206
766	unknown	204.564	0.097
777	octyl-2-methylpropanoate	756.305	0.358
784	alpha-cubebene	420.880	0.199
791	2-tridecanone (branched isomer)	566.371	0.268
799	2-tridecanone (branched isomer)	258.748	0.122
806	methyl-2-undecenoate	1041.976	0.493
808	alpha-ylangene	503.279	0.238
813	alpha-copaene	1203.824	0.570
826	methyl undecanoate	899.178	0.426
833	2-tridecanone	507.088	0.240
843	? sesquiterpene 206 m.w. 163 base peak	131.612	0.062
854	methyl ester of unsaturated fatty acid	136.607	0.065
867	caryophyllene	36181.296	17.125
874	beta-cubebene	2076.303	0.983
880	linalylisobutyrate	304.175	0.144
891	3-methylbutyloctanoate	143.006	0.068
906	humulene	43184.507	20.440
913	germacrene D	407.641	0.193
928	gamma-cadinene	4751.493	2.249
940	beta-selinene	4255.554	2.014

TABLE 2-continued

Essential Oil Profile of YCR4			
106 mg of 10% Adsorbate/150 C/5 Min./1.0 ug Int. Std. By DTD-GC-MS			
(Peak Area Integration from DTD-GC-FID Analysis)			
MS		GC-FID	
Spec #	Peak Assignment	Peak Area	Area %
950	alpha-selinene	6501.117	3.077
955	alpha-amorphene	531.661	0.252
964	methyl, 3,6-dodecadienoate	544.689	0.258
972	gamma-muuroline	344.080	0.163
984	delta-cadinene	5902.935	2.794
993	sesquiterpene w/ no common name	617.786	0.292
	CAS#16728-99-7, cadinene-type		
999	alpha-muurolene	696.655	0.330
1005	alpha-calacorene	123.304	0.058
1025	2-tetradecanone	460.135	0.218
1030	tetradecadienol isomer	576.686	0.273
1037	tetradecenol isomer	993.396	0.470
1051	caryophyllene oxide	1378.781	0.653
1070	methyl tridecenoate	901.896	0.427
1076	linalyl-3-methylbutyrate	556.047	0.263
1082	humulene oxide	1253.453	0.593
1090	unk. sesquiterpenol w/ 179 peak	478.628	0.227
1105	cadinol	511.249	0.242
1110	unk. sesquiterpenol w/ 179 peak	563.546	0.267
1121	delta-cadinol	1236.734	0.585
1127	beta-cadinol	418.047	0.198
1136	globulol	1354.295	0.641
1144	pentadecadienol	3621.791	1.714
1155	pentadecenol	1431.673	0.678
1166	unknown sequiterpenol	496.377	0.235
1188	2-pentadecanone	446.201	0.211
1216	possibly a linalool or geraniol ester	465.789	0.220
1228	pentadecadienyl acetate	388.543	0.184
1239	pentadecenyl acetate	843.677	0.399
1252	possibly famesol	1016.391	0.481

TABLE 2-continued

Essential Oil Profile of YCR4			
106 mg of 10% Adsorbate/150 C/5 Min./1.0 ug Int. Std. By DTD-GC-MS			
(Peak Area Integration from DTD-GC-FID Analysis)			
MS		GC-FID	
Spec #	Peak Assignment	Peak Area	Area %
1271	myristic acid	994.397	0.471
1361	possibly famesyl acetate	488.532	0.231
1371	2,4-heptadecadione	158.692	0.075
1378	hexadecadienol	588.667	0.279
1416	unknown	176.575	0.084
1470	3,7,11,15-tetramethylhexadecapentaene	1016.312	0.481
	isomer (272 m.w.)		
1491	palmitic acid	1433.655	0.679
Total		211276.645	100.000

Aroma profile: Mild, with citrus, spicy, floral, and piney notes.

Use: Used primarily in brewing for its aromatic properties.

Disease resistance:

Powdery mildew.—Moderate to high resistance.

Downy mildew.—Unknown; no infection observed to date.

Verticillium wilt.—Unknown.

Pickability: Good.

Harvest maturity: Late; after September 10.

Yield: 2200–3000 lb/ac (2466–3363 kg/ha) estimate.

I claim:

1. A new variety of hop plant substantially as herein shown and described.

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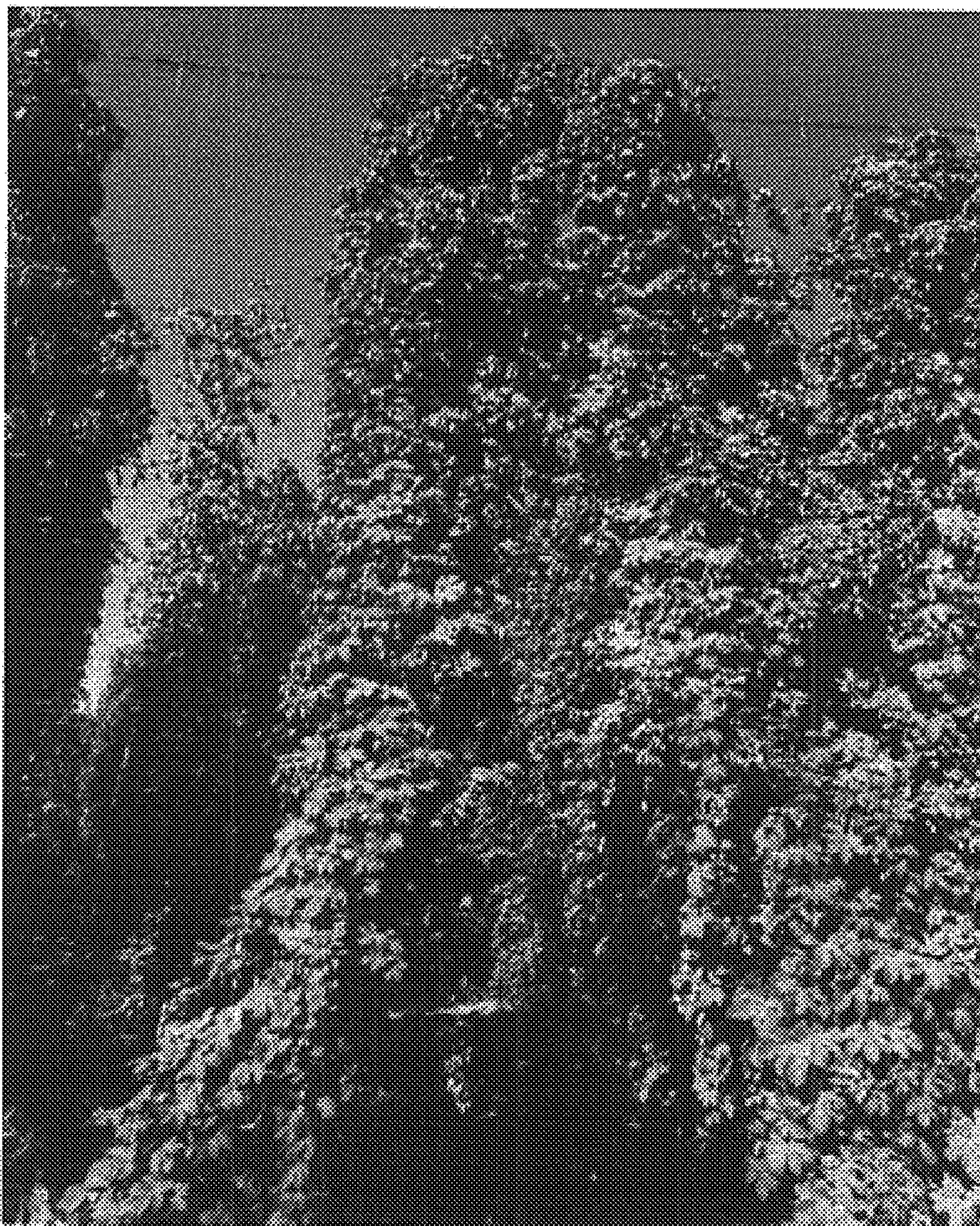


FIG. 1



FIG. 2



FIG. 3



FIG. 4



FIG. 5